

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 9/15/2011 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1 and 7-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kass et al. (US 6,589,048) in view of Imamura et al. (2002/0164475 A1) and Hamayoshi (JP 2002286397 A).

As applied to claim 1, Kass et al. '048 teach a roller with hollow body with shaft portions connected to the said body capable of operating at elevated temperature (col. 1, lines 7-10, Fig. 4). Kass et al. '048 further teach (Fig. 4 below) that an inner surface of said body comprises large-diameter regions on both sides (ends) and a small-diameter region in the center (between the two ends), and each of said shaft portions is

an integral hollow cylinder having a small-diameter portion, a large-diameter portion and a flange connecting said small-diameter portion and said large-diameter portion, said small-diameter portion and said large-diameter portion of each of said shaft portions have approximately the same thickness (at the particular region labeled in Fig. 4) and the large-diameter region of said body is connected to the large-diameter portion of said shaft portion (as shown in Fig. 4).

However, Kass et al. '048 do not explicitly teach the claimed thermal conductivity and surface roughness and that the inner diameter and outer diameter of the flange slowly expand together.

Imamura et al. teach that sink rolls/support rolls and shafts (used in high temperature environments) are made of ceramics (silicon nitride) for their high thermal conductivity (paragraph [0093], lines 1-19) having a surface roughness of up to 20 μm (paragraph [0044], lines 1-3).

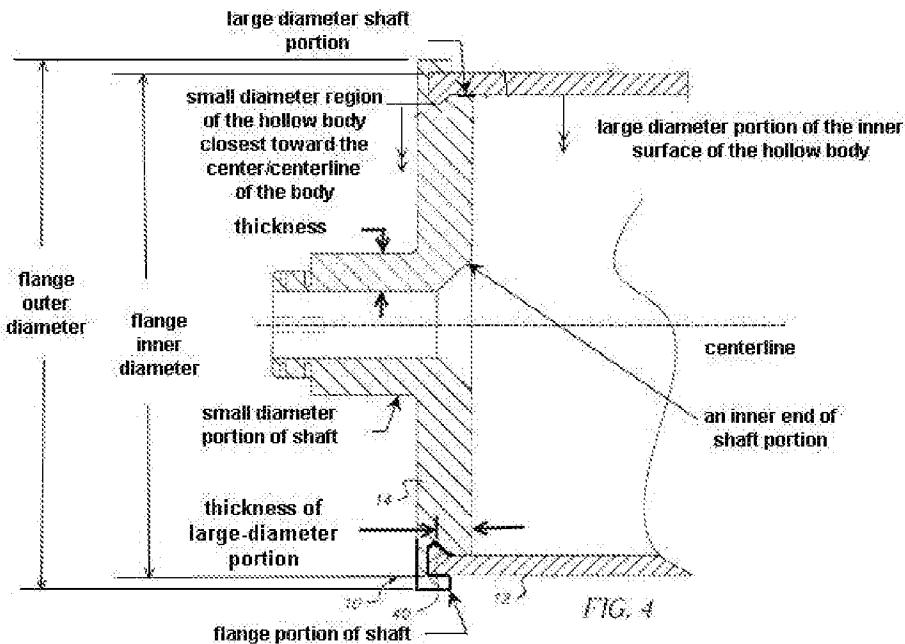
Hamayoshi teaches that it is well-known in the art to make tubular element used in a high temperature environment from ceramics (silicon nitride) with a thermal conductivity at the ambient temperature of 70 W/(m.K) (solution, lines 1-4).

It would have been obvious to one of ordinary skill in the art at the time of invention to have made the roll (hollow body and shaft portions) of Kass et al. '048 from the ceramics (silicon nitride) material having the surface roughness of up to 20 μm , as taught by Imamura et al., as an effective means of providing a roller with a desired surface finish suitable for contact with the marking particles (Kass et al., col. 3, lines 4-9) while being highly resistant to the operating temperature.

It would have been further obvious to one of ordinary skill in the art at the time of invention to have provided the roll of Kass et al. '048 with the ceramics (silicon nitride) material having a high thermal conductivity at the ambient temperature of 70 W/(m.K), as taught by Hamayoshi, considering its well-known properties of high corrosion resistance and high strength under high temperature environment.

The limitations of “a roll for use in a galvanizing pot” in claim 1 has not been given patentable weight because a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In the instant application, the structure of Kass et al. as modified by Imamura et al. and Hamayoshi is capable of performing the intended use and as such, reads on the claimed limitations.

The limitation of “a roll for use in a galvanizing pot” in claim has not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).



As applied to claim 7, Kass et al. '048/Imamura et al./Hamayoshi teach the invention cited. Kass et al. '048 further teach the roll wherein each large-diameter region of said body is shrink-fit to the large-diameter portion of each shaft portion (Fig. 4 above, col. 4, lines 7-10).

As applied to claims 9, 10 and 12, Kass et al. '048/Imamura et al./Hamayoshi teach the invention cited. Kass et al. '048 further teach the roll wherein a ratio of the

inner diameter of each small-diameter region of said body to the inner diameter of each large-diameter region of the body is 0.9 or more and less than 1.0 (as in claim 9 shown in Fig. 4 above); that the large-diameter region of said body is longer than the large-diameter portion of said shaft portion, so that there is a gap between the end of each small-diameter region of said body and the inner end of said shaft portion (as in claim 10 shown in Fig. 4 above) and that a ratio of the outer diameter of said body to the outer diameter of the small-diameter portion of each shaft portion is 2-10 (as in claim 12 shown in Fig. 4 above).

As applied to claim 8, Kass et al. '048/Imamura et al./Hamayoshi teach the invention cited. Kass et al. '048 (Fig. 4 above) further teach a shrink-fit connection between the shaft portion and the hollow body. However, the limitation of "shrink fitting ratio in a range of 0.01/1000 to 0.5/1000" is not given any patentable weight since both claims 7 and 8 are considered product-by-process claims and this product by process limitation is already taught by the structure of Kass et al. '048/Imamura et al./Hamayoshi and this extra limitation of the shrink fit ratio does not have any effect on the overall structure. Furthermore, it would have been obvious to one of ordinary skill in the art at the time of invention to have selected the claimed shrink fit ratio range to the roll of Kass et al. '048/Imamura et al./Hamayoshi in order to provide an effective and secured shrink fit connection of the parts without subjecting the joint to any extra stresses.

As applied to claim 11, Kass et al. '048/Imamura et al./Hamayoshi teach the invention cited. Kass et al. '048 (Fig. 4 above) further teach a ratio between the effective length to the outer diameter of the large-diameter portion of each shaft portion but do not explicitly teach the claimed range.

However, it is noted that the effective ratio between length to the outer diameter of the large-diameter portion of each shaft portion of the roller is a result-effective variable because it is well-known in the art of fabricating rollers, that depending on the length of the end shaft part and its ratio with the outer diameter of the shaft part, the shaft portion would have enough contact surface area for a more effective and secured engagement in the end of the hollow tube. As such, it would have been obvious to one of ordinary skill in the art at the time of invention to have selected the claimed ratio of 0.5-2.0 for the ratio between the effective length to the outer diameter of the large-diameter portion of each shaft portion dependent on the desired contact surface area with the inner surface of the hollow tube, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

4. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kass et al. in view of Imamura et al. and Hamayoshi as applied to claim 1 above, and further in view of Tanaka et al. (JP 04017928 A).

As applied to claim 6, Kass et al./Imamura et al./Hamayoshi teach the invention cited including the connecting shaft portions to both end portions of the hollow body but

do not explicitly teach the plurality of longitudinal grooves extending through the large diameter portion and the flange portion of the shaft.

However, Tanaka et al. teaches a roll wherein the total contact surface area of the shaft portion (Fig. 2(A)) which is inserted into the end of the hollow pipe is knurled with longitudinal grooves (2c) forming apertures communicating with the inside of the roll allowing an accurate, secure and effective engagement with the inner surface of the hollow pipe resulting in a strong joint.

It would have been obvious to one of ordinary skill in the art at the time of invention to have provided the total contact surface area of the shaft portion (including the large diameter and the flange portions as in Fig. 4 above) of Kass et al./Imamura et al./Hamayoshi as taught by Tanaka et al. as an effective means of accurately engaging the joining surfaces of the shafts with the inner surfaces of the hollow body resulting in an enhanced and secured connection.

Response to Arguments

5. Applicant's amendment to claim1 as filed on 9/15/2011 is accepted and as such, the rejection of claims 1 and 6-12 under 35 USC 112, first and second paragraphs are withdrawn. Furthermore, Applicant does not provide any substantive arguments and only states that none of the applied art of Kass '048, Imamura and JP '397 discloses or suggests a roll comprising a hollow body, wherein the inner surface of the body comprises large-diameter regions on both ends and a small-diameter region in between the large diameter regions, as claimed.

The Examiner respectfully disagrees with the above argument and reiterates that Kass '048 and secondary art of Imamura et al., Hamayoshi and Tanaka et al. do indeed teach the claimed roll structure having small and large diameter portions and end shafts having the claimed structure of small and large diameter portions connected with a flange as in claim 1 and the rest of the dependent claims.

It is noted that in the Applicant's response filed on 3/9/2011, the Applicant had presented arguments (Remarks, page 3, paragraph 3) that "The technical feature of the present claims is that the shaft portions of the roll have a flange sandwiched by the small-diameter portion and the large-diameter portion whose inner diameter and outer diameter slowly expand together. Thus, there is no portion where the thickness rapidly changes in the shaft portions of the presently claimed roll, thereby resulting in prevention of breakage of the shaft portions." Furthermore, during an Applicant initiated telephone interview on 5/25/2011, the Applicant once again explained why the transition segment of the flange between the small and large diameter portions of the end shaft portions is critical to the Applicant's invention. It was then that the Examiner suggested during the interview to further defining and clarifying the transition portion between the small and large diameter portions of the end shafts. However, in the latest claim amendments filed with the RCE on 9/15/2011, the Applicant has not only failed to further clarify the transition segment of the flange portion but decided to omit this critical limitation.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SARANG AFZALI whose telephone number is (571)272-8412. The examiner can normally be reached on 7:00-3:30 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Bryant can be reached on (571) 272-4526. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/SARANG AFZALI/
Primary Examiner, Art Unit 3726
9/27/2011